Geophysical Research Abstracts
Vol. 20, EGU2018-15443, 2018
EGU General Assembly 2018

Deciphering slow transient deformation from a spatial frequency analysis of InSAR data

Thomas Maurin (1), Josselin Berthelon (2), Damien Dhont (2), Fifamè Koudogbo (3), and Anne Urdiroz (3)

(1) TOTAL S.A., CSTJF, Pau, France, (2) GeoRessources Lab, Université de Lorraine/CNRS/CREGU, Vandoeuvre-lès-Nancy, France, (3) TRE ALTAMIRA Barcelona Altamira, Barcelona, España

InSAR is a convenient method to uniformly map transient deformations and was successfully used that way in fast deforming regions. However, because the radar signal might be subject to atmospheric perturbations, the monitoring of slow deforming areas remains challenging. Short term localised deformations could also blur the long term signal. The surface displacement may be described in the spatial frequency domain as a mix of these three components: long term, short term and atmospheric. An approach based on a spatial frequency analysis is presented with the aim of extracting the specific geological wavelength in order to capture strain variability in slow deforming regions.

This method is applied on the Neuquen foreland basin (Argentina) where InSAR processing was performed on a 100km2 area, using Sentinel radar images. Various wavelengths were detected but only a specific range is believed to contain the tectonic signal. A 20-10km wavelength displacement field was extracted to compute the principal strain axis. Noticeable correlations are found with geological structures. The surface strain field is also found compatible with borehole breakouts. The foreland basin is shown characterised by a mixed compression and extension regime controled by folding mechanism whereas the western folded domain is uniformly affected by extension. These observations tend to reconcile geological observations and demonstrate that extension and compression are actually synchronous.

The geological wavelength extraction method is believed appropriate for deciphering local surface strain variations even in slowly deforming areas. In the Neuquen basin, this approach also appears valuable to overcome atmospheric perturbations.